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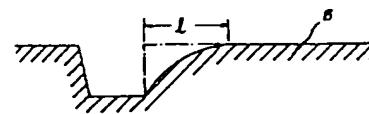
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## (54) PNEUMATIC TIRE

(11) 5-319025 (A) (43) 3.12.1993 (19) JP  
 (21) Appl. No. 4-132553 (22) 25.5.1992  
 (71) BRIDGESTONE CORP (72) YASUO HIMURO  
 (51) Int. Cl. B60C11/04, B60C11/11

PURPOSE: To provide a pneumatic tire which is improved in its deflected abrasion resistance without spoiling its high wet-performance and low noise characteristics.

CONSTITUTION: This pneumatic tire comprises land parts partitioned by at least one circumferential groove which extends along the circumference of the tread, and inclined grooves which extend from the tread end side to the center part of the tread, as being inclined to the equator of the tire, on the tread continued toroidally between a pair of side wall parts. The land parts have acute-angled corner parts 8 made by the circumferential groove and the inclined groove which joins the circumferential groove, or the inclined groove and another inclined groove which joins the former inclined groove, and these corner parts 8 are chamfered in the range of 5-30mm along the main groove from the joints with the inclined grooves, as leaving outward projected faces in the radial direction of the tire.



LI ANSWER 1 OF 1 WPIDS COPYRIGHT 1996 DERWENT INFORMATION LTD  
 ACCESSION NUMBER: 94-011911 (02) WPIDS  
 DOC. NO. NON-CPI: N94-009452  
 DOC. NO. CPI: C94-005330  
 TITLE: Pneumatic tire having longer life - comprises peripheral groove extending along tread which toroidally ranges across sidewalls and inclined grooves.  
 DERWENT CLASS: A95 Q11  
 PATENT ASSIGNEE(S): (BRID) BRIDGESTONE CORP  
 COUNTRY COUNT: 1  
 PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
JP 05319025 A		931203 (9402)*			4	B60C11-04

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
JP 05319025 A		JP 92-132553	920525

PRIORITY APPLN. INFO: JP 92-132553 920525  
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MAIN: B60C011-04

SECONDARY: B60C011-11

## BASIC ABSTRACT:

JP05319025 A UPAB: 940223

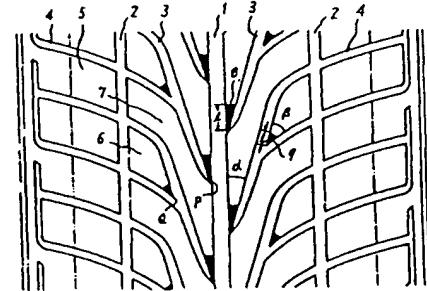
The tire comprises at least one peripheral groove extended along the periphery of a tread which toroidally ranges across between a pair of sidewalls and inclined grooves, extended from the end to the centre of the tread in inclination to a tire equator, land portions being partitioned with both of these.

The land portion has an acute corner encircled by the peripheral groove and the inclined groove joining together with this peripheral groove or the inclined groove and another inclined groove joining together with this inclined groove and chamfered over a 5-30mm area from the joining point of the inclined grooves along the groove formed as a main stream.

ADVANTAGE - The tire can be avoided from lopsided wear, resulting in a longer life.

Dwg.0/4

FILE SEGMENT: CPI GMPI  
 FIELD AVAILABILITY: AB  
 MANUAL CODES: CPI: A12-T01B



(FIG 3)



T-07.

(19)日本国特許庁 (JP)

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(22)出願日 平成4年(1992)5月25日

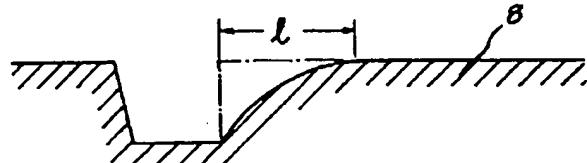
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(54)【発明の名称】 空気入りタイヤ

## (57)【要約】

【目的】 優れたウェット性能や低騒音特性を犠牲にすることなしに、耐偏磨耗性を向上した、空気入りタイヤを提供する。

【構成】 1対のサイドウォール間にまたがってトロイダル状に連なるトレッドに、このトレッド円周に沿って延びる少なくとも1本の周溝およびトレッド端側からトレッド中央部へ、タイヤの赤道に対して傾斜する向きで延びる傾斜溝にて陸部を区画した、空気入りタイヤであって、上記陸部は、周溝とこの周溝に合流する傾斜溝または傾斜溝とこの傾斜溝に合流する別の傾斜溝で囲まれる鋭角の隅部を有し、該隅部は、傾斜溝の合流点からその本流となる溝に沿った5~30mmの範囲にわたり、タイヤ径方向外側に凸となる面が残る、面取りを施す。



## 【特許請求の範囲】

【請求項1】 1対のサイドウォール間にまたがってトロイダル状に連なるトレッドに、このトレッド円周に沿って延びる少なくとも1本の周溝およびトレッド端側からトレッド中央部へ、タイヤの赤道に対して傾斜する向きで延びる傾斜溝にて陸部を区画した、空気入りタイヤであって、上記陸部は、周溝とこの周溝に合流する傾斜溝または傾斜溝とこの傾斜溝に合流する別の傾斜溝で囲まれる鋭角の隅部を有し、該隅部は、傾斜溝の合流点からその本流となる溝に沿った5~30mmの範囲にわたり、タイヤ径方向外側に凸となる面が残る、面取りを施してなる、空気入りタイヤ。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】この発明は、ドライ性能およびウェット性能を両立させた高性能の空気入りタイヤに関し、特にトレッドの偏磨耗を回避しようとするものである。

## 【0002】

【従来の技術】タイヤのウェット性能、特に耐ハイドロブレーニング性を向上し、また騒音の低下をはかるには、トレッドに、その円周に沿って延びる幅の広い周溝と、タイヤの赤道に対して強い傾斜で延びて周溝と交わる横溝とを配置することが有利である。

【0003】しかし、周溝と横溝とが交わる場合に横溝の傾斜を強くすると、その交差域にある陸部の隅が鋭角になって、この部分の剛性は低下するため、該隅部の磨耗が他の区域と比較して遅れて進行し、これが偏磨耗の原因となる。従って、横溝の傾斜角を小さくするには限界があり、特にウェット性能を向上する上での障害となっている。なお、周溝に横溝を開口させずその終端を陸部内に止めると、均一に磨耗を進行させることができるが、排水性能は大きく低下することになる。

【0004】一方、周溝および横溝の配置はそのままに、両者の交差域に形成される鋭角隅部での磨耗遅れによる偏磨耗を回避する手法として、該隅部を予め削減しておく、いわゆる面取りが有効である。

## 【0005】

【発明が解決しようとする課題】この面取りは、陸部表面から隅部の角に面する溝の底へ向けて、斜めに切断除去して、傾斜平面を残すのが、通例である。しかしながら、タイヤの使用開始から初期磨耗までの段階で、陸部における接地域が少なくなりすぎて、接地性が劣る点で不利であり、また隅部およびその周辺に空間が拡がるため、トレッドの意匠上の欠点となり得る。

【0006】そこで、この発明は、優れたウェット性能や低騒音特性を犠牲にすることなしに、耐偏磨耗性を向上した、空気入りタイヤを提供しようとするものである。

## 【0007】

【課題を解決するための手段】この発明は、1対のサイドウォール間にまたがってトロイダル状に連なるトレッドに、このトレッド円周に沿って延びる少なくとも1本の周溝およびトレッド端側からトレッド中央部へ、タイヤの赤道に対して傾斜する向きで延びる傾斜溝にて陸部を区画した、空気入りタイヤであって、上記陸部は、周溝とこの周溝に合流する傾斜溝または傾斜溝とこの傾斜溝に合流する別の傾斜溝で囲まれる鋭角の隅部を有し、該隅部は、傾斜溝の合流点からその本流となる溝に沿った5~30mmの範囲にわたり、タイヤ径方向外側に凸となる面が残る、面取りを施してなる、空気入りタイヤである。

【0008】さて図1にこの発明に従う空気入りタイヤのトレッドの要部を示し、このトレッドを、タイヤの赤道（トレッドの幅中央における円周）O上で延びる中央周溝1、この中央周溝1に沿ってこの溝の両側で対をなす周溝2、トレッド端Tからタイヤの赤道Oに対して傾斜する向きで延びて中央周溝1に合流する主傾斜溝3およびこの主傾斜溝3に合流する副傾斜溝4によって、トレッド端T寄りにブロック5、中央周溝1の両側のブロック6および7を、それぞれ多数区画してなる。なお、図示のトレッドパターンにおいては、主傾斜溝3にさらに副傾斜溝4が合流する配置としたが、副傾斜溝4を除くパターンとすることも可能である。すなわち、この発明は、溝が他の溝に合流することによって形成される陸部の鋭角隅部を有する、トレッドパターンであれば、全てに適合する。

【0009】主傾斜溝3は、トレッド両端Tから中央周溝1に向けて緩い傾斜で延び、周溝2を横切ったのち傾斜を強めて点Pにて中央周溝1に合流し、この合流点近傍に鋭角をなす隅部8が、中央周溝1および主傾斜溝3にて区画される。一方、副傾斜溝4は、トレッド側部域において、主傾斜溝3の緩傾斜部と平行に延び、トレッド中央とトレッド端のほぼ中間域で主傾斜溝3の急傾斜部に点Qにて合流し、この合流点Q近傍に隅部9が、主傾斜溝3および副傾斜溝4にて区画される。

【0010】ここに、隅部8および9は、図2に断面を示すように、タイヤ径方向外側に凸となる面が残る、面取りを施すことが肝要である。この面取りは、本流となる溝、すなわち隅部8では中央周溝1、また隅部9では主傾斜溝3、にそれぞれ沿う、その合流点PまたはQからの距離1が5~30mmの範囲にわたりて施し、トレッドの偏磨耗を回避する。なお、面取りは、タイヤの赤道Oの両側の、それぞれトレッド幅の1/4にわたる区域内における隅部に施すことが、とりわけ有効である。

【0011】また、主傾斜溝3は、中央周溝1に対して10~40°の傾斜角度αで合流すること、同様に副傾斜溝4は、主傾斜溝3に対して10~40°の傾斜角度βで合流することが、特に排水性の点で好ましい。

【作用】トレッドにおいて、周溝と交わる向きに延びる溝を、周溝に対する傾斜角を大きくした傾斜溝とし、トレッド端側へ水を流れ易くするとともに、踏み込み時の水圧抵抗が減少すること、およびこの傾斜溝を周溝に開口させて周溝内を流れる水を傾斜溝からトレッド端側へ導くこと、によって、排水性を向上することが可能である。

【0013】しかしながら、上記の傾斜溝を周溝、さらには別の傾斜溝とつなぐことによって、各溝で区画される陸部の隅が鋭角化し、ここが偏磨耗の核となる不利が生じる。この偏磨耗の核を解消するには、鋭角化した隅部に面取りを施すことが極めて有効であるが、図3に示すような傾斜平面を残す、従来の面取りでは、削減量が多くすぎるため、この空所がバターンノイズの新たな原因となり易く、また陸部の剛性が不足する、おそれもある。

【0014】そこで、この発明においては、隅部の面取りに当たり、図2に示した、タイヤ径方向外側に凸となる面を残すことによって、偏磨耗の核となり得る部分の削除を、陸部の剛性を低下することなく達成する。とくに陸部の面取り始端近傍では、図3に示した面取りと比較して、より高い接地圧が得られるため、接地時の陸部の動きを抑制でき、耐偏磨耗性や操縦安定性の向上に有効である。

【0015】ここで、隅部の面取りは、本流となる溝に沿って合流点PまたはQからの距離1が5mm以上の範囲にわたらないと、偏磨耗を回避することが難しく、一方距離1が30mmをこえる範囲にわたって施すと、トレッド踏面に占める陸部の比率が減少して、接地面不足によるグリップ力の低下だけでなく、溝体積の増加もまねき、そのためバターンノイズが悪化するので、5~30mmの範囲とする必要がある。そして、面取りの範囲は、隅部の角度(すなわち傾斜溝の角度 $\alpha$ および $\beta$ )が小さいほど拡げることが好ましい。また、面取りの深さは、陸部表面から隅部を区画する溝の底部に向けて、その溝深さの1/2以上の位置まで施すことが好ましい。

【0016】

【実施例】図1および図4に示したトレッドパターンに\*

	供試タイヤA	比較タイヤB
ハイドロプレーニング	120	100
操縦安定性	100	100
バターンノイズ	100	100
偏磨耗	115	115

【0022】

【発明の効果】この発明によれば、操縦安定性に代表さ

\*従って、タイヤサイズ225/50 R16の空気入りラジアルタイヤを2種類(供試タイヤAおよび比較タイヤB)試作した。

【0017】供試タイヤAにおいて、中央周溝1は幅:11mmおよび深さ:8mm、周溝2は幅:8mmおよび深さ:8mm、主傾斜溝3は幅:6~7mmおよび深さ:8mmで中央周溝1に16°(緩傾斜部は60°)の角度で合流し、副傾斜溝4は幅:6mmおよび深さ:6.5mmでタイヤの赤道に対して50~70°の傾斜角で延びて主傾斜溝3に35°の角度で合流し、さらに、それぞれの合流部の隅部8(1:18mm)および隅部9(1:9mm)に、図2に示したところに従う、凸状の面取りを施した。

【0018】一方、比較タイヤBは、幅:9mmおよび深さ:8mmの周溝10を間隔を置いて4本配置し、これら周溝間を、横溝11(傾斜角度70°)、横溝12(傾斜角度50°)および横溝13(傾斜角度80°)でつなげて成り、これらの溝で区画された陸部の隅には、面取りを施さなかった。

【0019】これらの試作タイヤを、それぞれハイドロプレーニング試験、操縦安定性試験、バターンノイズ試験および偏磨耗試験にて評価した結果を、表1に示す。なお、各試験の評価は比較タイヤの各試験結果を100としたときの指數であらわした。

【0020】ここで、ハイドロプレーニング試験は、内圧2.2kgf/cm<sup>2</sup>としたタイヤを、負荷荷重600kgf/cm<sup>2</sup>で水深5mmの水路を80~90km/hで走行させたときの、トレッド接地面積を測定して評価し、操縦安定性試験は、普通乗用車を用いてタイヤ内圧2.2kgf/cm<sup>2</sup>でドライバーが1名搭乗状態で、150~200km/hで走行したときの直進性およびレーンチェンジ性をドライバーがフィーリング評価し、バターンノイズ試験は、操縦安定性試験と同様の条件で、100km/hから40km/hの惰性走行時の車室内音をフィーリング評価し、そして偏磨耗試験は、内圧2.2kgf/cm<sup>2</sup>、一名乗車荷重条件にてR50mのサーキット路を60km/hにて10周定常円旋回したときのトレッド起伏状態を目視で評価した。

【0021】

【表1】

れるドライ性能および耐ハイドロプレーニング性に代表されるウェット性能、さらには低騒音特性を劣化するこ

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となしに、偏磨耗を回避することができ、長寿命の高性能タイヤの提供が可能となる。

【図面の簡単な説明】

【図1】この発明に従うトレッドパターンの展開図である。

【図2】隅部の断面図である。

【図3】隅部の断面図である。

【図4】従来のトレッドパターンの展開図である。

1 中央周溝

2 周溝

3 主傾斜溝

4 副傾斜溝

5 陸部

6 陸部

7 陸部

8 隅部

9 隅部

10 周溝

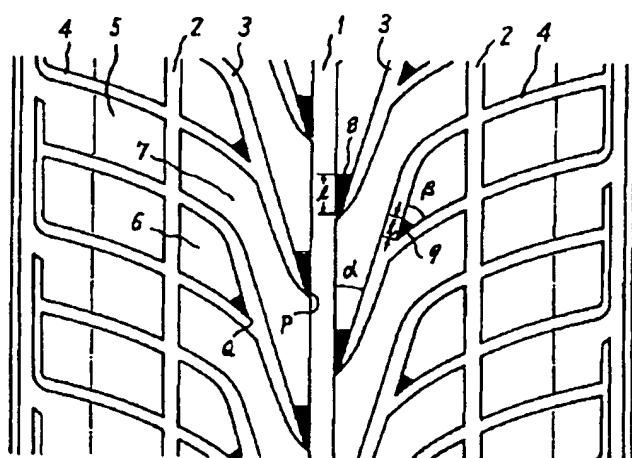
11 横溝

12 横溝

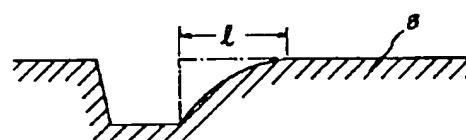
10 13 横溝

6

【図1】



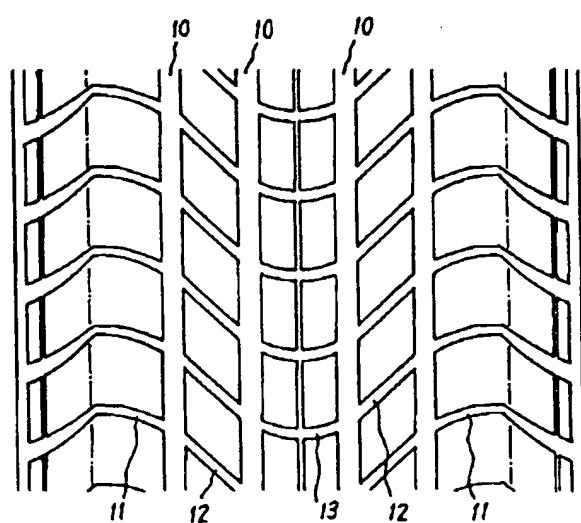
【図2】



【図3】



【図4】



PTO 00-3273

Japanese Kokai Patent Application  
No. Hei 5[1993]-319025

PNEUMATIC TIRE

Yasuo Himuro

UNITED STATES PATENT AND TRADEMARK OFFICE  
WASHINGTON, D.C. JULY 2000  
TRANSLATED BY THE RALPH MCELROY TRANSLATION COMPANY

JAPANESE PATENT OFFICE  
PATENT JOURNAL (A)  
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PNEUMATIC TIRE

[Kuki iri taiya]

Inventor: Yasuo Himuro

Applicant: 000005278  
Bridgestone Corp.

[There are no amendments to this patent.]

\* \* \*

Claim

Pneumatic tire characterized by the following facts: in the tread that connects a pair of sidewalls in toroidal form, land portions are partitioned by at least one circumferential groove that extends along the tread circumference and inclined grooves that extend from the tread end

side to the tread central portion and inclined with respect to the equator of the tire; wherein the aforementioned land portions have acute-angled corner portions defined by the circumferential groove and the inclined grooves merging with the circumferential groove and by the inclined grooves and other inclined grooves merging with said inclined grooves; the corner portions are chamfered such that a plane convex outward in the radial direction of the tire is left in a range of 5-30 mm from the merging point of the inclined grooves along the groove as the main flow channel.

#### Detailed explanation of the invention

##### Industrial application field

The present invention pertains to a high-performance pneumatic tire with good driving performance and good wet performance. In particular, the present invention pertains to a pneumatic tire characterized by the fact that it lopsided tire wear can be prevented.

[0002]

##### Prior art

In order to improve the wet performance of the tire, in particular, in order to improve hydroplaning resistance and to reduce noise, it is beneficial to arrange wide circumferential grooves that extend along the tire circumference and lateral grooves that extend at a significant inclination with respect to the equator of the tire and that cross the circumferential grooves.

[0003]

However, if the circumferential grooves and lateral grooves intersect, since the lateral grooves are inclined significantly, the corner of the land portion at the crossing site becomes an acute angle, so that the rigidity of this portion decreases, slowing the wear of this portion relative to the other regions. This leads to lopsided wear. Consequently, there is a limit to the reduction of the angle of inclination of the lateral grooves. In particular, this factor impedes efforts to improve wet performance. Also, if the lateral grooves are not opened in the circumferential grooves, and they terminate inside the land portions, although it is possible to realize uniform wear, the water removal performance deteriorates significantly.

[0004]

On the other hand, it has been found that chamfering, that is, precutting the corners, is effective in preventing lopsided wear due to slower wear of the acute-angled corner portions formed at the crossing sites between the circumferential grooves and lateral grooves, with the configuration of the circumferential grooves and lateral grooves left unchanged.

[0005]

#### Problems to be solved by the invention

Chamfering is usually carried out by cutting obliquely from the surface of the land portion toward the bottom of the groove facing the angle of the corner portion, leaving an inclined plane. However, in the stage from the start of use of the tire to the initial stage of wear, the ground contact region of the land portion becomes too small to exhibit good ground gripping performance. This is undesired. Also, since the space expands in the corner portion and its periphery, the tread appearance is compromised.

[0006]

The purpose of the present invention is to solve the aforementioned problems of the conventional methods by providing a pneumatic tire characterized by the fact that it has an improved lopsided wear resistance without sacrificing excellent wet performance and low noise characteristics.

[0007]

#### Means to solve the problems

The present invention provides a type of pneumatic tire characterized by the following facts: in the tread that connects a pair of sidewalls in toroidal form, land portions are partitioned by at least one circumferential groove that extends along the tread circumference and inclined grooves that extend from the tread end side to the tread central portion and inclined with respect to the equator of the tire, wherein the aforementioned land portions have acute-angled corner portions defined by the circumferential groove and the inclined grooves merging with the circumferential groove and by the inclined grooves and other inclined grooves merging with said inclined grooves; the corner portions are chamfered such that a plane convex outward in the radial direction of the tire is left in a range of 5-30 mm from the merging point of the inclined grooves along the groove as the main flow channel.

[0008]

Figure 1 is a diagram illustrating the main portion of the tread of the pneumatic tire of the present invention. The tread comprises blocks (5) near tread end T and blocks (6) and (7) on the two sides of central circumferential groove (1) in a large number divided by central circumferential groove (1) extending over the equator (the circumferential line along the middle of the width of the tread) O, circumferential grooves (2) arranged as a pair on either side of said central circumferential groove (1), main inclined grooves (3) extending obliquely from tread end

T to equator O of the tire, and secondary inclined grooves (4) that merge with said main inclined grooves (3). Also, in the tread pattern shown in the figure, secondary inclined grooves (4) are arranged to merge with main inclined grooves (3). However, it is also possible to have a pattern without secondary inclined grooves (4). That is, the present invention applies to any tread pattern as long as there are acute-angled corner portions of the land portions formed by grooves merging with other grooves.

[0009]

Main inclined grooves (3) extend with a mild slope from two ends T of the tread towards central circumferential groove (1). After traversing circumferential groove (2), the inclination becomes more pronounced, and it then merges with central circumferential groove (1) at point P. Corner portion (8) that forms an acute angle near the merging point is defined by central circumferential groove (1) and main inclined groove (3). On the other hand, secondary inclined grooves (4) extend in the tread side regions parallel to the gently inclined portions of main inclined grooves (3), respectively, and they merge with main inclined grooves (3) at points Q of the steeply inclined portions of the main inclined grooves almost in the middle region between the tread center and the tread end. Corner portion (9) near said branch point Q is defined by main inclined groove (3) and secondary inclined groove (4).

[0010]

As shown in the cross-sectional view of Figure 2, it is very important to chamfer corner portions (8) and (9) so that convex surfaces that extend radially outward are formed. This chamfering operation is performed along the groove that forms the main flow channel, namely, along central circumferential groove (1) for corner portion (8), and along main inclined groove (3) for corner portion (9), over a distance l of 5-30 mm from said branch point P or Q. In this way, lopsided wear of the tire can be avoided. Also, it is particularly effective to chamfer the corner portions on either side of equator O of the tire in regions of  $\frac{1}{4}$  the tread width.

[0011]

Also, in consideration of the water removal property, it is preferred that principal circumferential groove (3) merge with central circumferential groove (1) at an angle  $\alpha$  of inclination of 10-40°. Similarly, it is preferred that secondary inclined groove (4) merge with main inclined groove (3) at an angle of inclination  $\beta$  of 10-40°.

[0012]

### Operation

The grooves in the tread that extend at an angle to the circumferential grooves are inclined grooves with a large angle of inclination with respect to the circumferential grooves, and they facilitate the flow of water to the tread end side, and, at the same time, they reduce the hydraulic pressure when this portion presses against the ground. Also, the inclined grooves are opened in the circumferential grooves, so that water flowing in the circumferential grooves is guided from the inclined grooves to the tread end side. In this way, it is possible to improve the water removal property of the tread.

[0013]

On the other hand, since the aforementioned inclined grooves are connected to the other inclined grooves, acute-angled corner portions are formed in the land portions defined by the various grooves. They lead to lopsided wear and are thus undesirable. In order to get rid of this factor causing lopsided wear, it is very effective to chamfer for the acute-angled corner portions, leaving the inclined planes shown in Figure 3. In the conventional chamfering operation, however, since the cutting amount is too large, the voids formed by chamfering lead to pattern noise, and the rigidity of the land portion is insufficient.

[0014]

According to the present invention, when the corner portions are chamfered, as shown in Figure 2, convex surfaces that extend radially outward are formed. Thus, cutting off the portion that may cause lopsided wear can be realized without lowering the rigidity of the land portion. Specifically, in the vicinity of the beginning of the chamfer of the land portion, the ground contact pressure is greater than is the case for the chamfer shown in Figure 3. Consequently, movement of the land portion at the time of contact with ground can be suppressed, and it is effective in improving the lopsided wear resistance and steering stability.

[0015]

In this case, if chamfering of the corner portion is performed over a distance 1 from the branch point P or Q of less than 5 mm, preventing lopsided wear will be difficult. On the other hand, if chamfering exceeds a distance 1 of 30 mm, the proportion of the land portions among the ground-contact tread portion decreases, the ground contact surface area becomes insufficient so that the gripping force decreases, and the groove volume increases. Consequently, the chamfer distance is in the range of 5-30 mm. Also, the smaller the angle at the corner portions (that is,

angles  $\alpha$  and  $\beta$  of the inclined grooves), the greater the chamfer distance. This is preferred. As far as the depth of chamfering is concerned, it is preferred that chamfering be performed from the surface of the land portion towards the bottom of the groove that defines the corner portion to a depth  $\frac{1}{2}$  or more than the depth of the groove.

[0016]

#### Application examples

For the tread patterns shown in Figures 1 and 4, two types of pneumatic radial tires (test type tire A and comparative tire B) of tire size 225/50 R16 were used.

[0017]

For test tire A, central circumferential groove (1) has a width of 11 mm and a depth of 8 mm; circumferential grooves (2) have width of 8 mm and depth of 8 mm; main inclined grooves (3) have width of 6-7 mm and depth of 8 mm, and they merge with central circumferential groove (1) at an angle of  $16^\circ$  ( $60^\circ$  for the gently inclined portion); secondary inclined grooves (4) have width of 6 mm and depth of 6.5 mm, and they extend at an angle of inclination of  $50-70^\circ$  with respect to the equator of the tire and merge with inclined grooves (3) at a  $35^\circ$  angle. In addition, for corner portions (8) (1:18 mm) and (9) (1:9 mm) of the merging portions, convex chamfering is performed as shown in Figure 2.

[0018]

On the other hand, for comparative tire B, circumferential grooves (10) with width of 9 mm and depth of 8 mm are arranged a certain distance from each other. These circumferential grooves are connected by lateral grooves (11) (with angle of inclination of  $70^\circ$ ), lateral grooves (12) (with angle of inclination of  $50^\circ$ ), and lateral grooves (13) (with angle of inclination of  $80^\circ$ ). No chamfering is performed for the corners of the land portions defined by these grooves.

[0019]

For the aforementioned test-made tires, hydroplaning test, steering stability test, pattern noise test, and lopsided wear test were performed, with results listed in Table 1. These results are represented as indices with the result of the comparative tire taken as 100.

[0020]

More specifically, in the hydroplaning test, tires with internal pressure of  $2.2 \text{ kgf/cm}^2$  were used to run at a speed of 80-90 km/h under a load of  $600 \text{ kgf/cm}^2$  on a road having 5-mm-deep water layer on it, and an evaluation was performed by measuring the tread ground

contact area. In the steering stability test, the tires with internal pressure of 2.2 kg/cm<sup>2</sup> installed on a conventional sedan with driver was made to run at a speed of 150-200 km/h, and an evaluation was performed by the driver's assessment of his facility in maintaining a straight path or in changing lanes. In the pattern noise test, under the same conditions as those for the steering stability test, the noise within the car was evaluated subjectively at the time of running with idling engine from 100 km/h to 40 km/h. In the lopsided wear test, under an internal pressure of 2.2 kgf/cm<sup>2</sup> and with only the driver in the car as the load condition, the test car was driven at 60 km/h for 10 times around a R-50 m circuit road, and the state of skidding of the tread was evaluated by visual observation.

[0021]

Table 1

	①供試タイヤA	②比較タイヤB
③ ハイドロブレーニング	1 2 0	1 0 0
④ 操縦安定性	1 0 0	1 0 0
⑤ パターンノイズ	1 0 0	1 0 0
⑥ 偏磨耗	1 1 5	1 1 5

Key:

- 1 Test tire
- 2 Comparative tire
- 3 Hydroplaning
- 4 Steering stability
- 5 Pattern noise
- 6 Lopsided wear

[0022]

#### Effects of the invention

According to the present invention, produce a long-life, high-performance tire that can avoid lopsided wear without degradation of handling performance as represented by the steering stability, wet performance as represented by hydroplaning resistance, and low-noise performance.

#### Brief description of the figures

Figure 1 is a detailed diagram illustrating the tread pattern the present invention.

Figure 2 is cross-sectional view of a corner portion.

Figure 3 is a cross-sectional view of a corner portion.

Figure 4 is a detailed diagram illustrating a conventional tread pattern.

- 1 Central circumferential groove
- 2 Circumferential groove
- 3 Main inclined groove
- 4 Secondary inclined groove
- 5, 6, 7 Land portion
- 8, 9 Corner portion
- 10 Circumferential groove
- 11, 12, 13 Lateral groove

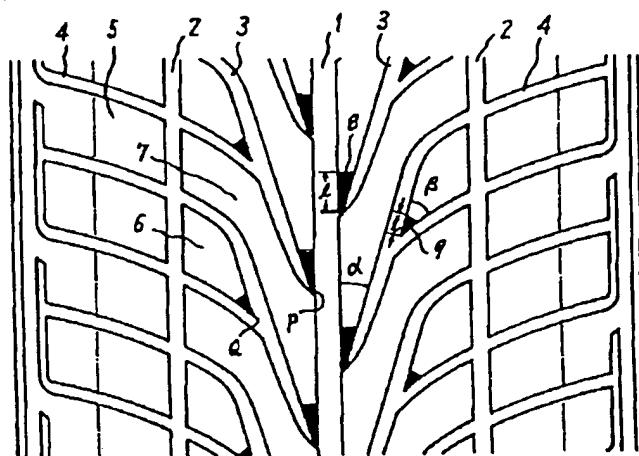


Figure 1

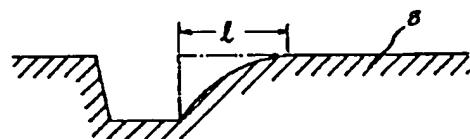


Figure 2



Figure 3

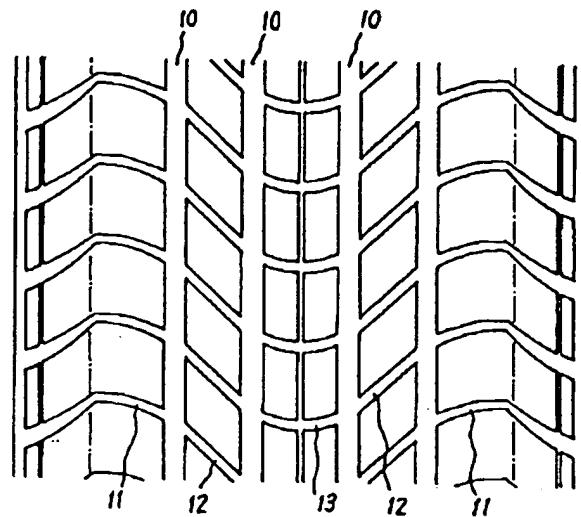


Figure 4